

## Autonomous Utility Connector for Lunar Surface Systems, Phase II

Completed Technology Project (2010 - 2013)



## Project Introduction

Lunar dust has been identified as a significant and present challenge in future exploration missions. Significant development is called for in the area of devices and structures that tolerate or mitigate the presence of lunar dust. Honeybee Robotics seeks to develop a scalable dust-tolerant, autonomous utility connector for lunar surface system applications with a focus on small pressurized rover recharge. Honeybee has heritage in developing mechanisms for extreme, dusty environments. There are many near-term applications of such a connector including: the utility and electrical connections that will be used on the next-generation lunar EVA suit, cryogenic utility connections that will be used to pass liquid hydrogen and liquid oxygen during in-situ resource utilization activities, and high-power electrical connectors capable of thousands of cycles for the Lunar Electric Rover (LER) battery recharge and data transfer functions. The Phase I program has resulted in (1) environmental testing of breadboard lunar dust-tolerant alignment features for autonomous utility connections capable of accommodating  $\pm 20^\circ$  angular and  $\pm 1.5\text{cm}$  lateral approach misalignment; and (2) a conceptual design that integrates the dust-tolerant alignment features with our dust-tolerant electrical connector and mechanical connection mechanisms based on lessons learned during environmental testing of the alignment feature breadboard. In Phase II, Honeybee will develop a prototype autonomous utility connector that integrates the alignment features, mechanical connection mechanism and electrical connection mechanism; testing the prototype in our lunar Dusty environment Simulation Test chamber that is capable of closely reproducing the conditions of the lunar surface. This effort will lead to the development of an autonomous dust-tolerant utility connector to TRL 6 with a focused application to the battery recharge connector for the LER being developed for the Constellation program.



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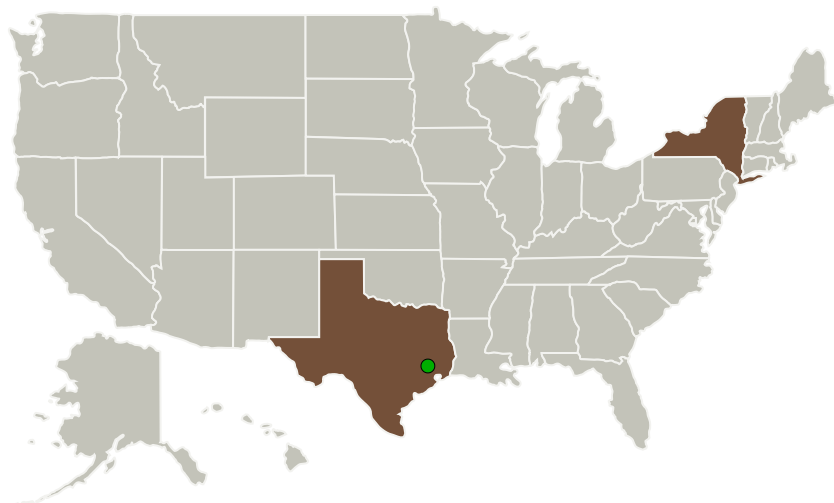
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## Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Honeybee Robotics, Ltd.	Lead Organization	Industry	Pasadena, California
● Johnson Space Center(JSC)	Supporting Organization	NASA Center	Houston, Texas

## Primary U.S. Work Locations

New York	Texas
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## Organizational Responsibility

**Responsible Mission Directorate:**

Space Technology Mission Directorate (STMD)

**Lead Organization:**

Honeybee Robotics, Ltd.

**Responsible Program:**

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

**Program Director:**

Jason L Kessler

**Program Manager:**

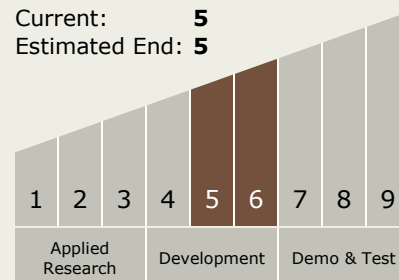
Carlos Torrez

**Principal Investigator:**

Jason Herman

## Technology Maturity (TRL)

Start: 6  
 Current: 5  
 Estimated End: 5



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### Technology Areas

#### Primary:

- TX04 Robotic Systems
  - └ TX04.6 Robotics Integration
    - └ TX04.6.2 Modeling and Simulation for Robots

### Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System